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ABSTRACT

This paper discusses the impact on teacher qualifications and earnings of public financing of private education. As societies become more frustrated with government-run schools, policies to provide public funds for private schools--for example, tuition subsidies, vouchers, or tuition tax credits--become more attractive. However, it is important to understand how elastic is the supply of private schools when agreements to provide public funds are enacted. Two of the key justifications for such agreements are that: (1) private schools provide a given quality of schooling at lower costs; and (2) public schools might respond positively to having some competition from private schools. Both of these justifications ultimately depend on whether private schools can expand the supply of schools under such agreements. The single most important determinant of the supply flexibility of private schools under such agreements is the elasticity of supply of teachers of a given quality. The paper sheds light on this important question by analyzing the effects of public schools on the qualification and salaries of private-school teachers. (Contains 27 references.) (DFR)

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Public Funding of Catholic Schools in Venezuela: Effects on the Qualifications and Salaries of Catholic School Teachers

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Abstract

The research reported here sheds light on the impact on teacher qualifications and earnings of public financing to private education. As societies become more and more frustrated with government-run schools, public policies to provide public funds for private schools – such as tuition subsidies, vouchers, or tuition tax credits – become more attractive. But, as a policy matter, it is important to understand how elastic is the supply of private schools when agreements to provide public funds to private schools are enacted.

Two of the key justifications for such agreements are that (1) private schools provide a given quality of schooling at lower cost, and (2) public schools might respond positively to having some competition from private schools. Both of these justifications ultimately depend on whether private schools can elastically expand the supply (of school places) under such agreements.

The single most important determinant of the elasticity of supply of private schools under such agreements is the elasticity of supply of teachers (of a given quality). This paper sheds light on this important question by analyzing the effects of public funding of private schools on the qualifications and salaries of private school teachers.

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I. Introduction

In the 1980s, the Venezuelan education system began facing a crisis. Efforts to expand the education system in the 1960s and early 1970s were successful. By the late 1970s, Venezuela had achieved 100% primary gross enrollment rates (World Bank 1994). This rapid expansion, however, did not come without costs. Presently, the quality of the education provided by public schools is very low. In an examination of reading ability among children from 32 countries, for instance, Venezuelan 9-year olds obtained the lowest score, and Venezuelan 13-year olds' scores were higher than only three countries. In both cases, only 5% of the Venezuelan students achieved a score equal to or higher than the international average (Reimers 1992). Additionally, in a 1999 report of the first comparative study of student achievement in primary education in Latin America, Venezuelan third- and fourth-graders obtained scores in language and mathematics that were consistently below the regional median (UNESCO 1999).

With the establishment of the Jesuit organization *Fé y Alegría* in 1958, the Venezuelan Association of Catholic Education (AVEC) began providing affordable quality education in low-income neighborhoods. A 1990 study comparing the efficiency-cost ratio of public and AVEC schools in low-income neighborhoods concluded that AVEC schools were less costly and more effective than public schools. Whereas in 1980, 94.1% of first-grade students entering AVEC schools finished the sixth grade by 1986 (the primary cycle), among public school students the comparable figure was 60%. At the time, AVEC teachers' earnings were less than half of public school teachers' earnings (MoE-AVEC 1990).

This study served as the foundation for a 1990 Ministry of Education (MoE) agreement to provide substantial funds to AVEC. Although prior to the agreement the MoE had occasionally provided subsidies to AVEC schools, these funds were assigned according to the will of the policy maker in office. With the 1990 agreement, public financing of AVEC schools became a permanent policy, and by 1996 public funds accounted for almost 90% of AVEC's operating revenues.[1] However, only AVEC schools in low-income urban, rural, and indigenous (inhabited primarily by natives) areas – referred to as "popular neighborhoods" – were to receive public funds.

When governments decide to directly finance private schools, they generally expect that the response of private schools will be to increase their supply of education. In Venezuela, a notion underlying the 1990 MoE-AVEC agreement was that with additional resources, the Catholic schools would be able to provide education to a greater number of children living in under-privileged neighborhoods, generating competition for or even replacing public schools in some areas. But, it is not always the case that schools can expand, even after receiving additional resources. Whether schools can expand depends on their physical capacity as well as on the characteristics of the local teacher labor market.

In terms of physical capacity, the former President of AVEC, Father Ramón Regueiro, argues that whether the Catholic schools were already working at full capacity

[1] My calculation from the 1996 MoE-AVEC Annual Report.

at the time of the agreement varies by school and neighborhood. Some schools were already over-extended and would have a hard time increasing access even if government funding increased. Other schools would have little difficulty in expanding access, holding all else equal.[2] In schools that were not over-extended, therefore, it may be that, by increasing available resources, the policy would lead to an increase in teachers' earnings. This salary increase would be necessary to attract sufficient teachers to serve additional students.

The characteristics of the teacher labor market also affect a school's ability to expand. In the case of AVEC schools, a relevant question is whether there are sufficient numbers of teachers readily available at the prevailing salaries. There are two sources of additional teachers for AVEC schools – adults with appropriate credentials who are currently not teaching and teachers in public schools. Attracting the latter group would probably take higher salaries because, historically, Catholic school teachers earned much less than their public school colleagues.

Given that the requirements to become a teacher in Venezuela are the same for public and private schools, these schools must dip into the same pool of teachers. This pool is formed by individuals with degrees from the *Pedagógico* (technical institute specializing in teacher education), an *escuela normal* (high school specializing in teacher education), or who have a bachelor's degree with an education major from a government-approved university program. However, AVEC schools are at a disadvantage with respect to public schools in terms of attracting teachers. This is because, while government teachers are guaranteed job stability and retirement benefits, AVEC cannot offer its teachers either of these advantages. As a result, if Catholic schools were to decide to expand their teaching staffs in order to increase supply, they may have to attract teachers who are also actual or potential employees of public schools. This may bid up the teacher salaries that AVEC schools must offer, resulting in a decrease in the public-private teacher earnings differential.

Therefore, in schools that could expand access, the critical question is whether it is possible to hire additional teachers at the prevailing wage. In other words, this is a question about the elasticity of the supply of teachers. In Venezuela, this is complicated by the classification of teachers by field of study (education or other) into certified and uncertified teachers and its effect on wages. Graduates of education programs from government-approved institutions are considered to be certified teachers. Graduates of all other programs, either from government-approved or other institutions, are considered to be uncertified for teaching. Official salaries, in both the public and Catholic school pay scales, are substantially higher for certified than they are for uncertified teachers.[3] Consequently, one option for school administrators is to change the mix of certified and uncertified teachers. This issue will be taken into account in the analysis.

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[2] Interview with Father Ramón Regueiro on January 2, 1998.

[3] Specifically, uncertified teachers earn between 9 and 21 percent lower salaries than teachers with normal school degrees; they earn between 12 and 36 percent lower salaries than teachers with degrees from the Pedagogic institute; and they earn between 20 and 46 percent lower salaries than teachers with a university degree in education (MoE-AVEC 1996).

II. Research Questions and Background

My research questions address three distinct ways in which the 1990 MoE-AVEC agreement may have had an impact on AVEC schools. I ask whether, as a result of the agreement:

1. *the mix of certified-uncertified teachers in AVEC schools changed,*
2. *the public-Catholic pay differential for certified teachers changed,* and
3. *the public-Catholic pay differential for uncertified teachers changed.*

I am interested in whether much of the funds provided under the agreement were used to increase the earnings of existing teachers, and in whether AVEC schools changed the mix of teachers as a result of the agreement. If there is no observable change in the public-AVEC teacher earnings differential, then AVEC may have used the majority of the revenues to hire additional teachers without changing the wage level, or it may have changed its mix of certified and uncertified teachers. Therefore, it is necessary to distinguish between certified and uncertified teachers in the analyses.

The research reported here sheds light on the impact on teacher earnings of public financing to private education. As societies become more and more frustrated with government-run schools, public policies to provide public funds for private schools – such as tuition subsidies, vouchers, or tuition tax credits – become more attractive. But, the impact on teacher salaries of public funding to private education is not thoroughly understood.

Studies of teacher compensation in the U.S. and other developed countries are relatively numerous (for example: Ballou and Podgursky 1997, Murnane *et al.* 1991, Manski 1987). Generally, these studies use multiple regression analysis to assess the effects of selected background variables – such as educational attainment, experience, gender, occupation, and race – on (log) earnings (Mincer 1974). Similar studies exist of teacher compensation in developing countries (Vegas *et al.* 1999, Piras and Savedoff 1998, Rojas 1998, Carnoy and Welmond 1997, Psacharopoulos *et al.* 1996).

Although researchers in the past had not been successful in establishing a link between teacher compensation and teacher quality or student outcomes, recent studies find that teacher compensation can have positive effects on the quality of education in the U.S. (Hanushek *et al.* 1999, Loeb and Page 1998). Also, there is substantial research on the effects of public financing of private providers in the U.S. (for example: Feldstein and Inman 1977, Auerbach and Feldstein 1987, Donahue 1989). These studies often conclude that a significant part of public subsidies to private providers is spent on wages. In contrast, there is little research on how government policies affect teacher earnings in Latin American and other developing nations. My Qualifying Paper will contribute to understanding the effect of a particular government policy on teacher earnings in a developing country.

In the sections that follow, I first present a brief overview of the Venezuelan education system in Section III. This section sets up the context for understanding the role of the AVEC schools and the potential impact of the MoE-AVEC agreement. In Section IV, I present the data and my empirical strategy. Section V contains the findings

from the analyses. Section VI contains a discussion of the findings. Last, in Section VII a present some conclusions from this study.

III. A Brief Overview of the Education System in Venezuela and the Role of Public and Private Education

The public education system in Venezuela was established by the Constitution of 1864, which stated that "the State had the responsibility of providing primary education to anyone who needed it" (Bigott 1997, p. 79 [my translation]). In 1870, dictator Antonio Guzmán Blanco passed the Decree of Public Instruction, which reformed the education system to include:

- national schools (which included primary and secondary schools, as well as universities, a Naval Academy, and an Academy of Fine Arts to be administered by the national government and provided at no cost to students);
- municipal schools (primary and secondary schools to be administered by each municipality and provided at no cost to students); and
- private schools (primary and secondary schools to be privately administered and provided at a cost to the student).

This structure is maintained basically intact today, with the exception of the addition of schools administered by state governments.

During the same period, *escuelas normales* (normal schools) were established to provide (primary school) teacher training at the secondary school level. Later, in 1895, the *Liceo Pedagógico* (Pedagogic Institute) was created, a technical institute that would be dedicated to the study of pedagogy. It was to be the secondary school teacher-training institute (Bigott 1997). These were the prevailing routes by which to become a teacher until the early 1970s, when the first Caldera administration (1969-1974) eliminated the *escuelas normales* and required that primary and secondary school teachers have a post-secondary education degree, from either the *Pedagógico* or an education program in one of the major universities.

Until the late 1960s, the public education system served a minority of the school-aged population. As a result of the country's new democratic system, which was inaugurated in 1958, the public education system began to provide wide access. The quantitative growth of the system was achieved primarily in the 1958-68 decade, when there were four policy priorities: (1) autonomous and free higher education; (2) technical/vocational secondary education; (3) elimination of illiteracy and total extension of primary education; and (4) salary increases for teachers (Rodríguez T., Nacarid 1997). Enrollment in primary education went from 775,586 students in 1958 to 1,380,500 students in 1967, an increase of 78%. In secondary schools, the increase during the decade was 404% -- from 45,675 students in 1958 to 230,303 students in 1967. In higher education, enrollment increased by 269% in this decade, from 14,474 students in 1958 to 54,840 students in 1967 (Rodríguez T., Nacarid 1997, p. 178).

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The separation between Church and State had been one of the most important goals of the independence movement, and each dictator during the 19th and 20th centuries made strong efforts to maintain it. An important development during the 1958-68 decade was the attenuation of the conflict between the Government and the Catholic Church regarding the provision of education that had prevailed during the dictatorship years. Beginning in 1960, the government began providing financial support to the Venezuelan Association of Catholic Education. However, this support was haphazard – depending on the will of each administration's responsible official (Mayz 1990).

The public financial support to Catholic Education did, however, represent a significant and increasing share of AVEC's revenues – up to 75% in 1988 (MoE-AVEC 1990). In 1990, with the signing of the MoE-AVEC agreement, the public support to Catholic education in Venezuela became a systematic and highly significant share of AVEC's revenues. In 1998, the Ministry of Education's subsidy to AVEC will account for 94% of AVEC's total revenues (MoE-AVEC 1998). The subsidy is a lump sum granted to the AVEC, which then distributes it to member schools according to each school's needs. Each year since 1990, AVEC requests from the government an amount equal to its estimated deficit – estimated costs minus estimated revenues – for the incoming year. The government reviews AVEC's submitted amount and, to date, has granted an amount equal to the original request.

However, the MoE-AVEC agreement does not involve providing public funds to all Catholic schools in Venezuela. Instead, the public financing is targeted to schools in under-privileged areas. AVEC member schools can be categorized as follows:

1. Residential: schools that serve children primarily in residential areas with all of the services and comforts common to residential neighborhoods. Usually, these students come from middle class and upper-middle class families.

2. Popular: schools that serve children from residential and commercial urban areas in which there are only basic services (and frequently these basic services are lacking).

3. Marginal: schools that serve a population coming from poor urban neighborhoods, neighborhoods that are isolated from the central cities and that generally lack even basic services.

4. Rural: schools that serve children from rural areas. Generally, their parents are farmers, and they live in very poor conditions, lacking most basic services.

5. Indigenous: schools that serve students from indigenous ethnic groups. Many of these schools have a bilingual education system.

Schools categorized as "residential" are not included in the agreement, and thus receive no public funds. Of all schools included in the agreement, "popular" schools account for 59.5%, "marginal" schools represent 25.9%, "rural" schools account for 9.7%, and indigenous schools account for 5.0% (MoE-AVEC 1996).

In addition, it is important to note that the agreement requires schools receiving public subsidies to purchase inputs at or below the cost of public schools. As a result,

teacher salaries in AVEC schools can be no higher than those of public school teachers (MoE-AVEC 1990).

To provide an idea of the role of Catholic education in Venezuela, Table 1 presents a breakdown of student enrollment by level in public and AVEC schools in the years of interest for this paper. During the 1988-1996 period, the proportion of the total primary enrollment attending AVEC schools remained at a relatively stable level, around 7 percent. In secondary schools, the proportion of students in AVEC schools increased from almost 10 percent in 1989-90 to 11 percent in 1995-96. Because overall enrollment in secondary schools increased during the period, this 1 percent increase in AVEC's *share* of total secondary enrollment represents an increase of more than 40 percent in the number of students being served by AVEC schools. In contrast, the number of secondary school students served by the public school system increased by less than 10 percent during the 1989-1996 period (and the share of the total secondary enrollment attending public schools declined from 76 to 66 percent). Thus, AVEC was able to expand its supply of education substantially during this period.

Table 1: Enrollment in public and AVEC schools, by education level, 1988-89 through 1995-96

	Pre-School		Primary		Secondary	
	Public	AVEC	Public	AVEC	Public	AVEC
1988-89	458,617	34,929	3,273,215	275,254	212,679	n/a
	82.50%	6.28%	86.65%	7.29%	76.44%	
1989-90	475,137	35,183	3,339,173	273,393	211,375	27,777
	83.27%	6.17%	86.26%	7.06%	75.56%	9.93%
1990-91	537,634	36,040	3,495,806	280,550	208,552	28,562
	84.69%	5.68%	86.25%	6.92%	74.11%	10.15%
1991-92	568,437	37,454	3,594,172	287,185	207,595	30,134
	84.26%	5.55%	85.78%	6.85%	71.73%	10.41%
1992-93	568,131	39,029	3,577,752	302,864	205,815	32,241
	83.12%	5.71%	84.74%	7.17%	68.94%	10.80%
1993-94	562,448	40,642	3,515,652	305,539	207,725	33,885
	80.89%	5.85%	83.36%	7.24%	66.75%	10.89%
1994-95	577,077	41,264	3,524,836	307,669	220,419	35,560
	80.54%	5.76%	82.95%	7.24%	66.05%	10.66%
1995-96	593,524	42,928	3,582,118	330,935	232,230	38,939
	80.07%	5.79%	82.41%	7.61%	65.80%	11.03%

Source: MoE-AVEC 1996 (Appendix 1), MoE 1997 (Table 1.5)

IV. Data and Empirical Strategy

IV.1. Dataset

My data come from two sources. I use AVEC's personnel records for 1989 and 1996 to provide information on salaries and characteristics of the teachers in the schools affected by the 1990 agreement. To complement this information with data on salaries and characteristics of public school teachers, I also use the *Venezuelan Household Survey* of 1989 and 1996. This survey contains individual-level information on personal characteristics – such as gender, age, state of residence, nationality, educational

attainment – and labor market information – including hours of work, earnings, occupation, and sector of the economy.

IV.2. Sample

The sample includes all teachers in the AVEC schools affected by the agreement in 1989 and 1996, as well as public school teachers sampled in the Venezuelan Household Surveys during the same years.

IV.3. Measures

The outcome variable is the natural log of monthly earnings in constant bolivars. I pool the data across the years 1989 and 1996, one year before the agreement and six years after the agreement. I have made the chronological gap after the agreement greater than that before in order to allow sufficient time for a response to the agreement to occur. The explanatory variables include: type of school (public or AVEC), educational attainment (primary, secondary, technical or university), gender and certification status of the teacher in the two years of interest, 1989 and 1996.[4] Table 2 presents descriptive statistics on the variables used in the analyses. See the Data Appendix for complete variable definitions.

Table 2: Sample means (and standard deviations) for the principal teacher descriptors used in the analyses, by type of school and year

	1989		1996	
Variable	AVEC n= 7,477	Public n=874	AVEC n=13,307	Public n=399
ln earn	8.733 (0.687)	9.209 (0.376)	7.908 (0.517)	8.408 (0.555)
Female	0.678	0.805	0.736	0.835
Primary	0.021	0.014	0.000	0.056
Secondary	0.236	0.540	0.142	0.360
Technical	0.257	0.050	0.314	0.061
University	0.483	0.395	0.242	0.523
Uncertified	0.003	0.257	0.302	n/a

[4] Following the model pioneered by Mincer (1974), ideally I would also account for potential experience. However, the AVEC personnel records for 1989 lack this information, making it impossible for me to account for the effect of experience on earnings. Nevertheless, using only the household survey data, I fitted the regression model for public school teachers and found the effect of potential experience on earnings to be close to zero in magnitude though statistically significant. Thus, I do not expect that my estimates to be significantly biased from the omission of the potential experience indicator.

Table 2 highlights some important differences between AVEC and public schools. First, as one would expect to see, in both years the average (natural log) earnings (in constant 1990 bolivars) of public school teachers are higher than those of their colleagues in AVEC. The real earnings of public and Catholic school teachers fell during the 1989-1996 period by close to 9 and 10 percent, respectively, when Venezuela experienced a major economic crisis. Second, the proportion of female teachers is high in both types of school, but it is slightly lower in AVEC schools. This may be a result of the presence for Catholic priests as teachers in AVEC schools. Last, it is worth distinguishing two separate issues regarding the proportion of teachers by education level: (a) the breakdown of teachers by education level differs between public and AVEC schools; and (b) the breakdown by education level changes among AVEC teachers between 1989 and 1996, while it remains constant among public school teachers.[5] In particular, public school teachers are more likely than AVEC teachers to be secondary (normal) school graduates, whereas they are less likely to be technical school graduates. The proportion of AVEC teachers who are uncertified increased dramatically from 1989 to 1996, an issue to which I return in subsequent sections.

IV.4 Data Analyses

I use multiple regression analysis to estimate the impact of the 1990 MoE-AVEC agreement on the relative earnings of AVEC school teachers – that is, on the ratio of the earnings of AVEC school teachers to those of public school teachers. The natural log of real monthly teacher earnings is the dependent variable. Because my goal is to estimate the effect of the 1990 agreement on teacher earnings, I must control for any systematic shocks that may also affect their earnings but do not result from the agreement. Thus, I control for year effects to capture any secular trends in teacher earnings. To identify the treatment group, I include a dummy variable for type of school as a predictor. Last, I control for teacher characteristics usually hypothesized to affect earnings, such as educational attainment and gender (Mincer 1974).

My principal regression model is:

$$W = \beta_0 + X\beta_1 + \beta_2 AVEC + \beta_3 YEAR + \beta_4 AVEC*YEAR + \varepsilon$$

where:

W is the natural log of monthly earnings in constant 1990 bolivars[6]

X is a vector of teacher control characteristics (including gender and educational attainment)

AVEC represents the type of school where the teacher works (1 if AVEC, 0 if public)

YEAR represents year (1 if 1996, 0 if 1989)

ε is the residual

[5] Data on public school teachers' certification status was unavailable for 1996, and likely as a result the proportion of public school teachers who are university graduates appears higher than in 1989.

[6] In converting the nominal salary data into constant bolivars, I used the Consumer Price Index from the Inter-American Development Bank's (IDB) Economic and Social Database (ESDB), available at the IDB website (http://www.iadb.org/int/sta/ENGLISH/staweb/dbase_esdb_frame.htm).

In this model, β_4 – the coefficient on the two-way interaction of AVEC and YEAR – captures the unique effect of the agreement on the earnings of AVEC school teachers. If this coefficient is statistically significant, then I may infer that the agreement had an impact on teacher earnings in the affected schools. If it is positive, then I may conclude that the agreement led to an increase in the earnings of the teachers in the affected schools relative to public school teachers, thereby answering my research question.

Given the salary structure described in Section II, whereby uncertified teachers earn significantly less than teachers holding education degrees, it is important to separate uncertified from certified teachers. However, differences between the two datasets in the way that the variables were reported made this distinction only partially possible. In the Catholic schools dataset, the educational attainment of teachers is reported as either secondary, technical, university or uncertified. This implies that individuals in this dataset with reported secondary, technical, or university degrees are certified teachers. All other teachers are uncertified, but there is insufficient information to deduce the highest level of education attained (recall from Section II that university graduates who majored in careers other than education are considered uncertified, as are secondary school graduates from non-normal [teacher training] schools).

In the household survey for 1989, there is highly detailed information on the highest degree attained, from which one can construct the same categories as in the Catholic datasets. Unfortunately, this is not the case in the 1996 survey. In this year, the survey only reports the highest level of educational attainment – i.e., primary, secondary, technical, or university. Thus, one cannot distinguish certified from uncertified teachers in 1996.[7]

Not being able to control for the differential effect of certification status on teacher earnings is potentially problematic because of the possibility that AVEC schools used the increased revenues from the agreement to increase supply by hiring "cheaper" teachers, i.e. those with uncertified status. If, in fact, AVEC did hire a larger number of uncertified teachers in 1996 than in 1989, then our estimates of the impact of the MoE-AVEC agreement on relative teacher earnings, without accounting for the change in the composition of teachers by certification status, is likely to be biased. Thus, it may be necessary to analyze the effects of the agreement on relative wages for certified and uncertified teachers separately.

To address this problem, I first look at whether there was a change in the proportion of certified and uncertified teachers in AVEC schools between 1989 and 1996. If there was an increase in the proportion of uncertified teachers, then it is probable that my estimates of the change in the public-AVEC teacher earnings differential without accounting for certification status will be biased downward. If this is the case, then I can obtain an unbiased estimate of the effect of the 1990 agreement on the public-AVEC teacher earnings differential by conducting my analysis using the only sample of teachers for which there is complete information – teachers with technical education degrees.

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[7] A reasonable approach is to fill the missing data in 1996 by using the predicted coefficients from a probit or logistic regression analysis of the probability of being certified in 1989. I estimated such models with various explanatory variables and, unfortunately, was unable to get any predictive power.

Because all teachers with a technical school degree are graduates of the *Pedagógico*, they are all certified. As a result, only for this group can I obtain an unbiased estimate of the impact of the agreement on AVEC teachers' relative earnings.

I use this unbiased estimate of the impact of the agreement on AVEC teachers' relative earnings, the observed change in the earnings of AVEC teachers during the 1989-1996 period reported in Table 2, and the information on the change in the mix of uncertified and certified teachers to obtain estimates of how the agreement impacted on the relative wages of AVEC's certified and uncertified teachers.

V. Findings

The data indicate that between 1989 and 1996, AVEC did increase its proportion of uncertified teachers dramatically. In fact, the proportion of all AVEC teachers who are uncertified increased from less than one percent (about 0.3%) in 1989 to 30 percent in 1996 (see the Data Appendix). In contrast, the proportion of uncertified public school teachers appears to have remained relatively stable during the 1989-1996 period. In the 1989 household survey the proportion of public school teachers who were uncertified was about 26 percent. Although I do not have the breakdown of certification status among public school teachers for the 1996 household survey, published information from the Ministry of Education indicates that the proportion of uncertified public school teachers in 1996 was about 25 percent (MoE 1997).

The facts above suggest that the estimate of the impact of the 1990 agreement on relative teacher earnings will be affected by the dramatic increase in the proportion of uncertified teachers in AVEC schools. Therefore, I tailor the analysis to try to assess the size of the effect of certification status on the estimate of the impact of the 1990 agreement on the relative earnings of AVEC teachers.

First, I attempt to get an unbiased estimate of the effect of the agreement on relative teacher earnings by estimating the model among technical school graduates only, who are the only group for whom I have complete information in both years. As said above, all technical school graduates who teach are graduates from the *Pedagógico*, or teacher training institute, and thus are all considered to be certified. This model allows me to obtain an unbiased estimate of the agreement's impact on AVEC teachers earnings relative to those of public school teachers, but only for teachers with a technical school degree who comprise about one third (28 percent) of all teachers in the sample. Table 3 presents this estimate of the impact of the MoE-AVEC agreement on the public-private teacher earnings differential using the multiple regression model described in Section III.

All the estimated coefficients are statistically significant at the 1% level or better, and have the expected signs. The estimated earnings for female teachers with technical education degrees are about 24 percent higher than their male colleagues ([exp^β_1=0.214]-1, p-value=0.000). In the year prior to the agreement, the estimated earnings of AVEC teachers with technical school degrees were about 55 percent lower than those of public school teachers with technical school degrees ([exp^β_2=-0.807]-1, p-value=0.000). In the 1989-1996 period, the real earnings of public school teachers with a technical degree are estimated to have decreased by 74 percent ([exp^β_3=-1.314]-1, p-

value=0.090); this was a period when Venezuela experienced a deep economic crisis. Finally, the coefficient on the two-way interaction of AVEC and year, β_4, suggests that the agreement had a large and positive effect on the earnings of AVEC teachers with technical school degrees relative to those of public school teachers with technical education (β_4=0.472, p-value=0.002). This indicates that the agreement resulted in an estimated 60 percent increase in the ratio of earnings of AVEC teachers to those of public school teachers with a technical school degree.

Table 3: Estimated coefficients (and standard errors) from the linear regression model of the effect of the MoE-AVEC agreement on log monthly earnings, n=6,162

		Model 1 (Technical School Graduates Only)
β_0	Intercept	9.387**
		(0.090)
β_1	Female	0.214**
		(0.016)
β_2	AVEC	-0.807**
		(0.091)
β_3	Year	-1.314**
		(0.152)
β_4	AVEC*Year	0.472*
		(0.152)
R-Squared Statistic		0.312

*p-value<.01; **p-value<.001

VI. Discussion

VI.1 Changes in the mix of certified-uncertified teachers in AVEC schools

There were important changes in the mix of certified and uncertified teachers in AVEC schools that resulted from the agreement. Specifically, the proportion of AVEC teachers who are uncertified increased from 0.3 percent in 1989 to 30 percent in 1996, representing an increase of 99 percentage points! As a result, the proportion of AVEC teachers who are certified decreased significantly, from almost 100 percent to only 74 percent, a decrease of more than 25 percentage points. These figures suggest that even after the increased revenues resulting from the agreement, AVEC schools would have been unable to afford the large expansion in enrollment documented in Section III had they maintained the 1989 certified-uncertified mix of teachers in 1996.

VI.2 Changes in the public-Catholic pay differential of certified teachers

My findings also suggest a substantial increase in the earnings of certified teachers in AVEC schools relative to those of certified teachers in public schools. Although data limitations allowed me to estimate this change in the differential only for teachers with technical school degrees, there is no reason to believe that certified teachers with normal school or university degrees would have fared any differently. Thus, it is

likely that the estimated increase of 60 percent in the relative earnings of certified AVEC teachers with technical degrees also took place among all other certified teachers.

VI.3 Changes in the public-Catholic pay differential of uncertified teachers

Although the data available do not permit estimating the distinct impact of the agreement on the relative earnings of uncertified teachers, I can approximate it by using the information available and some assumptions.

In particular, I know the observed mean real earnings of all AVEC teachers relative to all public school teachers in the sample, without distinguishing certification status (Table 2). In addition, I have data on the mean earnings for AVEC certified and uncertified teachers in both periods, and on the mean earnings for public school certified and uncertified teachers only for 1989. I also know the mix of certified and uncertified teachers in both school systems, for both years of interest. The problem is that I am missing information about the mean earnings of public school certified and uncertified teachers in 1996.

Algebraically, we can write an expression for estimating the percentage change in the mean real earnings of all AVEC teachers relative to those of all public school teachers. We can break down the mean earnings of all AVEC and public school teachers into a weighted average of the mean real earnings of certified and uncertified teacher, weighted by the corresponding mix of certified and uncertified teachers in the relevant school system. That is, we can express this as:

$$\frac{\left[E_{a,t,96} \equiv E_{a,c,96}\left(1 - S_{a,u,96}\right) + E_{a,u,96}\left(S_{a,u,96}\right)\right]}{\left[E_{p,t,96} \equiv E_{p,c,96}\left(1 - S_{p,u,96}\right) + E_{a,u,96}\left(S_{p,u,96}\right)\right]} \Bigg/ \frac{\left[E_{a,t,89} \equiv E_{a,c,89}\left(1 - S_{a,u,89}\right) + E_{a,u,89}\left(S_{a,u,89}\right)\right]}{\left[E_{a,t,89} \equiv E_{a,c,89}\left(1 - S_{a,u,89}\right) + E_{a,u,89}\left(S_{a,u,89}\right)\right]} - 1 \equiv X$$

where:

$E \equiv$ mean real earnings

$S \equiv$ share of total teachers

a ≡ AVEC

p ≡ Public

t ≡ total

c ≡ certified

u ≡ uncertified

89 ≡ year 1989

96 ≡ year 1996

In terms of the expression above, the missing data are those corresponding to $E_{p,c,96}$ and $E_{p,u,96}$, the mean real earnings of certified and uncertified public school teachers in 1996. Since the second term is necessary to estimate the effect of the

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agreement on the relative earnings of uncertified AVEC teachers, I need some simplifying assumptions. I use two assumptions to approximate an estimate of the effect of the agreement on the relative earnings of uncertified AVEC teachers: (1) the assumption that the ratio of real earnings of certified to uncertified public school teachers remained constant from 1989 to 1996; and (2) the assumption that the ratio of real earnings of certified to uncertified public school teachers in 1996 is equal to the ratio of real earnings of certified to uncertified AVEC teachers in 1996.

Using the first assumption, I estimate that after the agreement, the relative earnings of AVEC uncertified teachers declined by 21 percent. Using the second assumption, I estimate that the decline in the real earnings of uncertified AVEC teachers relative to the earnings of public school teachers was close to 12 percent. These estimates, although admittedly very rough, do suggest that the estimated increase in the relative earnings of AVEC teachers only took place among the certified teachers.

VII. Conclusions

In this paper, I set out to assess the impact on the relative earnings of AVEC teachers of the 1990 agreement between the Venezuelan Ministry of Education and the Venezuelan Association of Catholic Education (AVEC). My goal was to find out whether a high proportion of the government funds to AVEC resulted in increased expenditures on teacher salaries.

My findings suggest that the earnings of existing AVEC teachers did increase, probably to attract the teachers needed for the extensive expansion in AVEC schools that took place between 1989 and 1996. Whereas in 1989, the real earnings of AVEC teachers were only 53 percent of those of public school teachers, by 1996, this gap had narrowed to 85 percent. For certified teachers, I was able to estimate that the agreement results in an increase in real earnings of 60 percent relative to the corresponding teachers in public schools. Thus, it is clear that expanding the supply of AVEC schools using only certified teachers would have been very costly.

In order to expand their supply of education, AVEC schools responded by hiring massive numbers of new uncertified teachers. Whereas in 1989, there were only 21 uncertified teachers (as compared to 7,456 certified) in AVEC schools, by 1996, this number had increased to 4,018 teachers (as compared to 9,289 certified). This suggests that the supply of uncertified teachers in Venezuela is much more elastic than that of uncertified teachers. As a result, AVEC schools were able to hire massive numbers of uncertified teachers at an average wage in 1996 that was 17 percent lower than that of certified teachers.

Additionally, given the clause in the 1990 agreement establishing that AVEC cannot pay higher salaries to its teachers than does the public school system as well as its current financial situation which does not permit AVEC to offer some of the benefits that public schools offer, it is unlikely that AVEC schools would have attracted enough certified teachers, even at public school wage levels. So it is reasonable that AVEC responded by dramatically increasing the proportion of uncertified teachers. A question

that arises is how this increase in the share of uncertified teachers affected the quality provided by AVEC schools. This is a question for future research.

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Data Appendix

Table A1 presents the variable names and definitions of the variables that will be used in the analyses.

Table A1: Variable Names and Definitions

Variable Name	Definition
ln_earn	natural log of monthly earnings in real 1990 bolivares
female	dichotomous variable that takes on the value 1 if the teacher is female and 0 if male
avec	dichotomous variable that takes on the value 1 if the teacher works in a AVEC school sector and 0 if s/he works in a public school
year	dichotomous variable that takes on the value 1 if the observation corresponds to 1996 and 0 if it corresponds to 1989
secondary	dichotomous variable that takes on the value 1 if the individual completed the secondary school cycle or less and 0 otherwise. This is the omitted category in the regression analyses.
technical	dichotomous variable that takes on the value 1 if the individual completed a technical education degree and 0 otherwise
university	dichotomous variable that takes on the value 1 if the individual holds an university degree and 0 otherwise
uncertified	dichotomous variable that takes on the value 1 for AVEC teachers who have a degree in a field other than education[8]

[8] The two datasets provide different information with respect to non-graduate status. In the Catholic schools datasets for 1989 and 1996, a teachers' educational attainment is recorded as primary, secondary, technical or non-graduate. In the household survey, the highest degree attained is recorded – e.g. primary, secondary, technical, or university. However, in the 1989 household survey (but not in the 1996 survey), workers were asked to also report the academic field corresponding to their highest degree attained. This information allowed us to construct the non-graduate dummy variable for public school teachers in 1989 (e.g. university and technical school graduates in fields other than education). Unfortunately, we were unable to derive this variable for public school teachers in the 1996 household survey.

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